

less, having an odour of orange, and possesses a bitter taste. It is lighter than water, having a specific gravity of 0.889, and a boiling point of 175° C. (337° F.). This oil is employed in the scenting of soaps and in the preparation of various perfumes.

ORANGE.—Oil of orange should not be confounded with the oil of neroli; while the latter is obtained from the flowers, the former is pressed from the rind of the fruit. Orange oil has a golden-yellow colour, with an odour and taste of the fruit. It has a specific gravity of 0.830 to 0.860, and boils at 171° C. (330° F.). Two varieties are met with in commerce, that from the rind of the bitter orange and that from the rind of the sweet orange; there is very little difference between them. They are employed in the preparation of perfumes, mineral waters, and in scenting soap.

SASSAFRAS.—This oil is extracted from the wood of the sassafras tree, *Sassafras officinalis*, which yields about 2½ per cent. of the oil; it has a yellow colour, a peculiar but pleasant odour and taste. It is rather heavier than water, its specific gravity being 1.082. It contains a peculiar principle named safrol, which is also contained in oil of camphor. Oil of sassafras is largely used for the scenting of soap and other articles.

STAR ANISE.—This oil is extracted from the seed-pods of a Chinese tree (*Illicium anisatum*); it closely resembles oil of anise in all particulars, and is generally preferred by perfumers. It is lighter than water, having a specific gravity of 0.892. These pods yield about 2 per cent. of the oil. A similar oil, but to a smaller extent, is obtained from the seeds of a Japanese tree (*Illicium religiosum*) that possesses family resemblance to the Chinese tree. This oil is, however, not so good in quality.

WINTER GREEN.—This oil is extracted from the leaves and twigs of the winter green, *Gaultheria procumbens*. This

size of a greyhound, shy, but very agile, and somewhat nocturnal in its habits. The musk pod from which the odorous secretion is obtained is found only in the males, the females being devoid of any odour; the pod is found near the navel between the flesh and the skin, and is composed of several layers of thin skin in which the musk is found in the form of grains, of irregular shape, roundish and ovoid, varying in size. The pod is developed before the animal is born; at first, and for two years after birth, the contents of the pod are soft, milky in appearance, and have rather an unpleasant odour; at the end of the two years the contents change into musk and increase in quality afterwards; at first the weight averages 8 oz., and at full growth may reach 2 oz.; the average is, however, 1 to 1½ oz. It varies also with the seasons, being greatest in the rutting season.

The animals are usually snared in specially constructed snares of fences and ropes, then killed, and the pod extracted and dried in the sun, although other methods are occasionally adopted.

Musk makes its appearance in two forms in commerce—"musk in pod" and "musk in grain"; the former is the material in its natural receptacle, while the latter is that removed from the pod. It is imported from (1) Tonquin, China, and Tibet in small chests, containing twenty-five packets of musk encased in lead. This is considered the best quality, and commands the highest price, but is most adulterated. (2) Assam, which comes in bags packed in a box, containing 200 pods, rather irregular in size and form, and having a strong odour. (3) Kanardin or Russian, which is very inferior in quality and poor in odour.

Musk for use in perfuming is prepared as an extract or tincture by means of alcohol; it is rarely used alone, but is combined with other perfumes. It is an exceedingly permanent perfume; one grain of musk will emit its scent for

SOAP MANUFACTURE.

Brown Windsor Soap.

Tallow soap	. . . . .	50 lb.
Coconut oil soap	. . . . .	25 „
Palm oil soap	. . . . .	25 „
Oil of cinnamon	. . . . .	4 oz.
Oil of cloves	. . . . .	2 „
Oil of caraway	. . . . .	1 „
Oil of sassafras	. . . . .	2 „
Oil of bergamot	. . . . .	4 „
Bismarck brown	. . . . .	8 „

Honey Soap.

Tallow soap	. . . . .	75 lb.
Palm oil soap	. . . . .	25 „
Oil of verbenæ	. . . . .	6 oz.
Oil of lemon grass	. . . . .	6 „

Another formula is :—

Tallow soap	. . . . .	50 lb.
Palm oil soap	. . . . .	25 „
Olive oil soap	. . . . .	25 „
Oil of verbenæ	. . . . .	6 oz.
Oil of bergamot	. . . . .	6 „
Oil of citronelle	. . . . .	5 „
Tincture of musk	. . . . .	$\frac{1}{2}$ „

These will be found sufficient recipes, but others will be presently given under another head which the soap-maker may utilise for this process if he thinks fit.

Toilet Soaps by the Cold Process.—The cold process may be employed for making some of the cheaper grades of toilet soaps. The details of this process will be found described in another place; here will be given simply some formulæ which may be used. It may be pointed out that it is not every perfume which may be employed, on account of the presence of alkali in the materials during the process of manufacture. Still, the soap-maker may use a large number of formulæ and produce a great variety of toilet soaps by the cold process.

White Windsor Soap.

Coconut oil	50 lb.
White tallow	50 „
Caustic soda lye at 70° Tw.	50 „

TOILET SOAPS.

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Stir the fats which have been previously melted together with the alkali ;
when well mixed add the perfumes as follows :—

Oil of caraway	6 oz.
Oil of lavender	4 „
Oil of thyme	2½ „

Brown Windsor Soap.

Coconut oil	45 lb.
Tallow	45 „
Palm oil	10 „
Caustic soda lye at 70° Tw.	50 „
Oil of lavender	2½ oz.
Oil of cassia	6 „
Oil of caraway	1½ „
Oil of neroli	½ „
Bismarck brown	3 „

Violet Soap.

Coconut oil	40 lb.
Tallow	10 „
Caustic soda lye at 70° Tw.	25 „
Dried orange peel	1½ „
Violet root	2½ „
Tincture of musk	1½ oz.
Oil of bergamot	1 „
Oil of citron	1 „
Oil of cassia	1½ „
Oil of neroli	½ „
Peru balsam	½ „
Tolu balsam	½ „

Another formula is :—

Coconut oil	40 lb.
Tallow	10 „
Caustic soda lye at 70° Tw.	25 „
Oil of lavender	1 oz.
Oil of bergamot	2 „
Oil of cassia	1 „
Tincture of benzoin	2 „
Balsam of Peru	1 „

Almond Soap.

Coconut oil	40 lb.
Tallow	60 „
Caustic soda lye	50 „
Mirbane	½ „
Oil of bergamot	½ „

SOAP MANUFACTURE.

Rose Soap.

Coconut oil	100 lb.
Caustic soda lye at 70° Tw.	50 "
Oil of rose geranium	5 oz.
Oil of bergamot	5 "
Tincture of musk	$\frac{1}{2}$ "
Eosine	1 "

Glycerine Soap.

Coconut oil	50 lb.
Caustic soda lye at 70° Tw.	50 "
Glycerine	4 "
Oil of rose geranium	$1\frac{1}{2}$ "
Oil of sassafras	$\frac{3}{4}$ "
Oil of thyme	$\frac{1}{2}$ "

Another formula for glycerine soap is :—

Coconut oil	48 lb.
Palm oil	2 "
Caustic soda lye at 70° Tw.	25 "
Glycerine	4 "
Orange peel	$\frac{1}{2}$ "
Violet root	1 "
Caramel	7 oz.
Oil of lavender	$1\frac{1}{2}$ "
Oil of bergamot	$\frac{3}{4}$ "
Oil of cassia	$\frac{1}{4}$ "
Oil of sassafras	$\frac{1}{4}$ "

Lemon Soap.

Coconut oil	50 lb.
Tallow	50 "
Caustic soda lye at 70° Tw.	50 "
Oil of lemon	$\frac{3}{4}$ "
Oil of bergamot	5 oz.
Oil of lemon grass	6 "
Oil of cloves	$2\frac{1}{2}$ "

Honey Soap.

Coconut oil	50 lb.
Tallow	40 "
Palm oil	10 "
Oil of citronelle	1 "
Oil of bergamot	$\frac{1}{2}$ "
Oil of caraway	1 "
Caustic soda lye at 70° Tw.	50 "

MILLED TOILET SOAPS.

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Bouquet Soap.

Coconut oil	50 lb.
Tallow	40 "
Bleached palm oil	10 "
Oil of bergamot	12 oz.
Oil of sassafras	4 "
Oil of cloves	4 "
Oil of thyme	4 "
Oil of neroli	2 "
Caustic soda lye at 70° Tw.	50 lb.

Orange Soap.

Coconut oil	50 lb.
Tallow	25 "
Palm oil	25 "
Oil of orange peel	12 oz.
Oil of cinnamon	1 "
Oil of thyme	2½ "
Caustic soda lye at 70° Tw.	50 lb.

If it be desired to produce coloured soaps by the cold process, the soap-maker will find a wide range of the coal tar colours open to him. Eosine will give him a variety of tints from the faintest blush rose to a deep pink. Acid green may be used for green tints, acid blue for blue tints, acid violet for lavender to violet shades, Bismarck brown for browns, acid yellow for yellow. With these by combining them together a variety of pleasing effects may be obtained. (See farther on as to colouring soaps.)

Milled Toilet Soaps.—We may now proceed to consider in some detail the production of toilet soaps by a process of comparatively modern origin, but which promises in the future to almost, if not quite, entirely replace the older methods of preparing toilet soaps. The milling system had its origin in France, where more attention has been paid to toilet soaps than in any other country; from there it has gradually spread to other countries. It is to the credit of the French that the best machines for carrying out the milling system are of French invention.

There is no question of the superiority of milled soaps

over other soaps. Weight for weight they are of more value, because they contain less water, while it is an acknowledged fact that the reworking to which the soaps are subjected improves their quality. Then again, milled soaps are usually prepared from the best materials, as it is hardly worth while to put the extra work and expense involved in milling into a soap made from crude materials. Milled soaps are superior to other soaps in use on account of the fact that their small proportion of water and their dense texture cause them to waste away less rapidly than ordinary soap. The appearance, too, of milled soap is much superior to a toilet soap made by other processes.

The process of milling is a merely mechanical one to which a well-boiled soap is subjected, and it is carried out in special machinery, which has been previously described in the chapter on Soap Machinery (see p. 211). We shall not repeat these descriptions here, but simply speak of the process itself, pointing out its special features, and emphasising the points which require attention from the soap-maker.

The principal machines employed in the milling of toilet soaps are, according to the order in which they are used: (1) Cutting machine, (2) drying machine, (3) crushing mill with four granite rollers, (4) continuous squeezing machine, or, as it is sometimes known, the plodding machine, (5) steam-stamping process.

The soap which is to be treated is first cut into strips by means of the cutting machine, from which they are transferred to the drying machine. The degree of fineness of cutting the soap has some influence on the speed of drying it, fine chips drying quicker than coarse chips. In some cases the drying machine is so constructed that this preliminary cutting can be dispensed with, and the soap dealt with as it comes from the soap-kettles. This is done in the case of using the continuous automatic drying machine; the